HISTORIC PROPERTIES REPORT

NEWPORT ARMY AMMUNITION PLANT

NEWPORT INDIANA

FINAL REPORT

AUGUST 1984

This document was prepared by the MacDonald and Mack Partnership, Minneapolis, Minnesota, under Contract CX-0001-2-0033 between Building Technology Incorporated, Silver Spring, Maryland, and the Historic American Buildings Survey/Historic American Engineering Record, National Park Service, U.S. Department of the Interior.

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EXECUTIVE SUMMARY

The Newport Army Ammunition Plant (Newport AAP) is a government-owned, contractor-operated installation under the Army's Armament, Munitions and Chemical Command (AMCCOM). The plant is situated on a 6,990-acre site near the Wabash River, about two miles south of Newport, Indiana, and thirty-two miles north of Terre Haute. Constructed in 1942-1943, Newport AAP (then called the Wabash River Ordnance Works) was the first large-scale American plant to manufacture the military high explosive RDX and related compounds. Facilities for the production of heavy water were added in 1943-1944.

Laid away in 1946, Newport AAP was rehabilitated and reactivated in 1951 to produce RDX for the Korean War; the Heavy Water Plant resumed production in 1952. Both activities were suspended, and the plant laid away, in 1957. In 1959 the Army constructed a facility at Newport AAP for the manufacture of Chemical Agent VX, a nerve agent. Part of the Heavy Water Plant was used in the new facility, and the rest was demolished. Manufacture of Agent VX began in 1961 and ended in 1968, when the production facility was placed in standby status. Filling and shipping operations continued until 1969. Five lines for the continuous production of TNT were built between 1968 and 1973; all were laid away in 1975. Except for a part of the Acid Area, the RDX facilities were demolished in the late 1970s.

Newport AAP currently comprises 339 buildings, 175 of which date from the original construction period. Because of the plant's changing functions and the demolition of obsolete facilities, no World War II-era production lines remain intact. There are no Category I, II, or III historic properties at Newport AAP.

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PREFACE

This report presents the results of an historic properties survey of the Newport Army Ammunition Plant (Newport AAP). Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at the Newport AAP. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archaeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was

project manager for the historic properties survey. Technical assistance was provided by Donald C. Jackson.

Building Technology Incorporated acted as primary contractor to HABS/HAER for the historic properties survey. William A. Brenner was BTI's principal-in-charge and Dr. Larry D. Lankton was the chief technical consultant. Major subcontractors were the MacDonald and Mack Partnership and Jeffrey A. Hess. The author of this report was Robert Ferguson. The author gratefully acknowledges the help of Captain Craig A. Morehead, Plant Commander; William Walters and Jerry Kovarik of the government staff; and David Rader, Mary Aycock, Bernard Kavanaugh, Charles Phillips, and Grady Sockwell of Un royal, Incorporated.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation HAER No. IN-53.

Chapter 1

INTRODUCTION

SCOPE

This report is based on an historic properties survey conducted in January 1984 of all Army-owned properties located within the official boundaries of the Newport Army Ammunition Plant (Newport AAP). The survey included the following tasks:

- Completion of documentary research on the history of the installation and its properties.

- Completion of a field inventory of all properties at the installation.

- Preparation of a combined architectural, historical, and technological overview for the installation.

- Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 42 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army. Archival copies of the cards, with their accompanying photographic

negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

METHODOLOGY

1. Documentary Research

The Newport Army Ammunition Plant (Newport AAP) was constructed during 1942-1943 as a government-owned, contractor-operated facility designed to manufacture the high explosive RDX and its related compounds Compositions A, B, and C. In addition to these major products, the Newport AAP also manufactured the nitric acid used in RDX production, and heavy water for nuclear research. To place the Newport AAP in proper historical and technological perspective, research was conducted on the manufacturing processes employed at the installation. Published doumentary sources were identified by consulting standard bibliographies of military history, engineering, and the applied sciences. Unpublished sources were identified by researching the historical and technological archives of the U.S. Army Armament, Munitions, and Chemical Command (AMCCOM) at Rock Island Arsenal.[1]

A concerted effort was also made to locate published and unpublished sources dealing specifically with the architecture and history of the Newport AAP. This site-specific research was conducted primarily at

the AMCCOM Historical Office at Rock Island Arsenal, the Vermillion County Public Library in Newport, and the Newport AAP government and contractor archives. Research was also conducted at the Holston Army Ammunition Plant (HSAAP) in Kingsport, Tennessee, the only other RDX-manufacturing plant in the United States. Information on the HSAAP, often including information on Newport AAP, was obtained at the Kingsport Public Library (Palmer Room), and the HSAAP (contractor's archives, government administrative archives, real property records office, facilities engineer's office). The Indiana State Historic Preservation Office (State Department of Natural Resources, Division of Historic Preservation and Archaeology) was contacted for information about the Newport AAP, but had no relevant data.[2]

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and photographs supplied by installation personnel; and installation master planning, archaeological, environmental assessment, and related reports and documents. A complete listing of this documentary material may be found in the bibliography.

2. Field Inventory

Architectural and technological field surveys were conducted in January 1984 by Robert Ferguson. Following general discussions with Captain Craig Morehead, and Bill Walters and Jerry Kovarik of the

government staff, and Dave Rader of the Uniroyal, Inc. staff, the surveyor was provided with an escort for a tour of the installation. Mary Aycock of the Uniroyal, Inc. staff served as guide. Thereafter, the surveyor was permitted to inspect most areas of the installation on an unescorted basis. Ms. Aycock again accompanied the surveyor to the Wells Area on the Wabash River, the Coast Guard LORAN station, and the barn (Building TC-99) on State Highway 63. all within the boundaries of Newport AAP but outside the fenced production and storage areas. Inspection and photography of the "High Security Area" in the Chemical Plant (including Building 144, the Agent Storage Area, and the Flare Tower) was prohibited (see Appendix A).

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.[2] All areas and properties were visually surveyed. Building locations and approximate dates of construction were noted from the installation's property records and field-verified. Interior surveys were made of the major facilities to permit adequate evaluation of architectural features, building technology, and production equipment.

Field inventory forms were prepared for, and black and white 35 mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to represent all buildings of that type. Field inventory forms were also

completed for representative post-1945 buildings and structures.[3] Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

3. Historical Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and the field inventory. It was written in two parts: 1) an introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses. Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of Historic Places. These criteria require that eligible properties

possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following:[4]

A. Are associated with events that have made a significant contribution to the broad patterns of our history.

B. Are associated with the lives of persons significant in the nation's past.

C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.

D. Have yielded, or may be likely to yield, information important in pre-history or history.

Properties thus evaluated were further assessed for placement in one of five Army historic property categories as described in Army Regulation 420-40:[5]

Category I	Properties of major importance
Category II	Properties of importance
Category III	Properties of minor importance
Category IV	Properties of little or no importance

Category V Properties detrimental to the significance of adjacent historic properties.

Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used to assess the importance not only of properties of traditional historical interest, but also of the vast number of standardized or prototypical buildings, structures and production processes that were built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.

2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process. This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples of the design or process was considered to be. This

criterion was also used for non-military structures such as farmhouses and other once prevalent building types.

3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.

4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance, but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures; rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- Current structural condition and state of repair. This information was taken from the field inventory forms and photographs, and was often supplemented by rechecking with facilities engineering personnel.

- The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review by Building Technology Incorporated. It was then sent in draft to the subject installation for comment and clearance and, with its associated historical materials, to HABS/HAER staff for technical review. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archaeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

NOTES

1. The following bibliographies of published sources were consulted: Industrial Arts Index, 1938-1957; Applied Science and Technology Index, 1958-1980; Engineering Index, 1938-1983; Robin Higham, ed., A Guide to the Sources of United States Military History (Hamden, Conn.: Archon Books, 1975); John E. Jessup and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington, D.C.: U.S. Government Printing Office, 1979); "Military Installations," Public Works History in the United States, eds., Suellen M. Hoy and Michael C. Robinson (Nashville: American Association for State and Local History, 1982), pp. 380-400. AMCCOM (formerly ARRCOM, or U.S. Army Armament Materiel Readiness Command) is the military agency responsible for supervising the operation of government-owned

munitions plants; its headquarters are located at Rock Island Arsenal, Rock Island, Illinois. Although there is no comprehensive index to AMCCOM archival holdings, the agency's microfiche collection of unpublished reports is itemized in ARRCOM, Catalog of Common Sources, Fiscal Year 1983, 2 vols. (no pl.: Historical Office, AMCCOM, Rock Island Arsenal, n.d.).

2. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).

3. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.

4. National Park Service, How to Complete National Register Forms (Washington, D.C.: U.S. Government Printing Office, January 1977).

5. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).

Chapter 2

HISTORICAL OVERVIEW

BACKGROUND

The Newport Army Ammunition Plant (Newport AAP) is a government-owned, contractor-operated installation situated on a 6,990-acre site near the Wabash River, about two miles south of Newport, Indiana, and thirty-two miles north of Terre Haute (Figure 1). Constructed in 1942-1943 by the original operating contractor, E. I. du Pont de Nemours & Company, Newport AAP (then called the Wabash River Ordnance Works)* was the first large-scale American plant to manufacture the military high explosive RDX and the RDX-based Compositions A, B, and C. RDX, the most powerful explosive known before the invention of nuclear weapons, had been developed in England; Newport AAP used the British Woolwich production method with only minor modifications. The Woolwich method, however, was extremely inefficient, and the newly-developed Bachmann method soon rendered it obsolete. Newport AAP operated throughout World War II, but had less than one-fifth the production capacity of the Holston AAP, America's only Bachmann-method plant, located at Kingsport, Tennessee.[1] In 1943-1944, du Pont added facilities to Newport AAP to produce heavy water for nuclear research.

Laid away in late 1946, Newport AAP was reactivated in 1951 to produce RDX for the Korean War; the Liberty Powder Defense Corporation, a subsidiary of the Olin Corporation, rehabilitated and operated the plant. The heavy

*The Wabash River Ordnance Works was combined with the Newport Army Chemical Plant, and renamed, in 1964. For the sake of clarity and brevity, this report will use the current name, Newport Army Ammunition Plant.

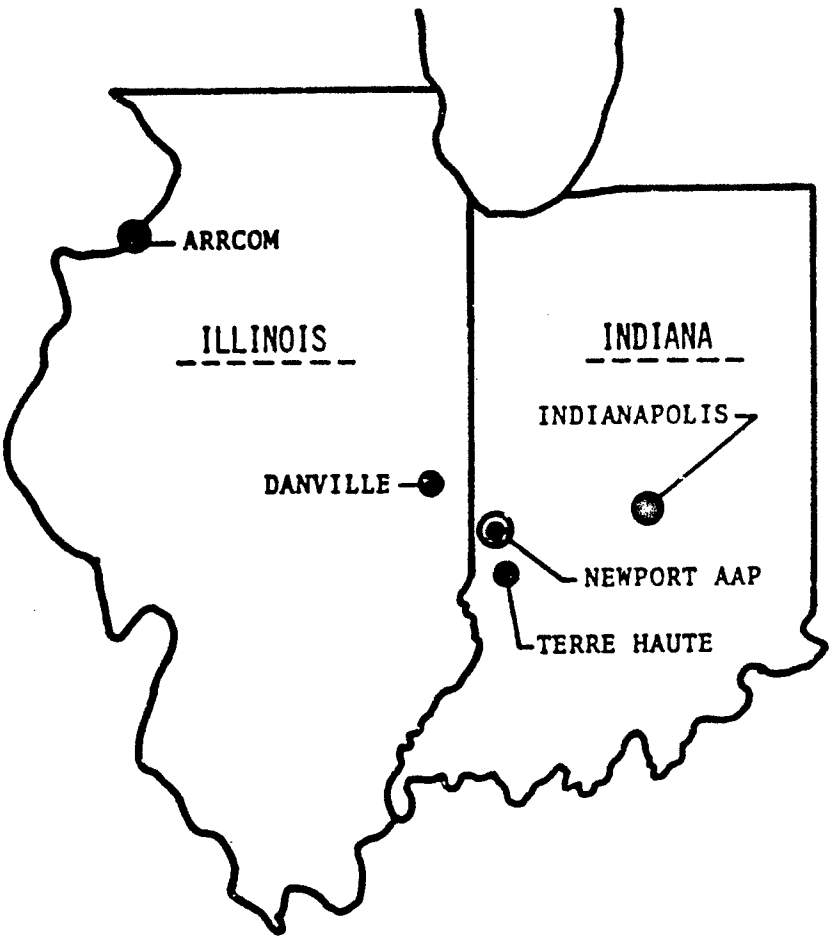

Figure 1: Newport AAP, Location Map. (Source: Government files, Newport AAP)

water plant resumed production in 1952 under the operation of du Pont. Both activities were suspended, and the plant laid away, in 1957.

In 1959 the Army constructed a facility at Newport AAP for the manufacture of Chemical Agent VX, a nerve agent.[2] The FMC Corporation, the constructing and operating contractor, used part of the heavy water plant in the new facility and demolished the rest. Production began in 1961 and ended in 1968, when the production facility was placed in standby status. Filling and shipping operations continued until 1969.

Five lines for the continuous production of TNT, designed by du Pont, were built between 1968 and 1973. Du Pont supervised the layaway of these lines, and withdrew from the plant, in 1975. Since that time, Uniroyal, Inc., has operated the plant in "standby" status.[3]

Newport AAP currently comprises 339 buildings, 175 of which date from the original construction period (Figure 2). The RDX production lines were demolished in the late 1970s; only part of the acid plant and a few service buildings remain.

WORLD WAR II

In June 1940, shortly after the fall of France, President Franklin D. Roosevelt established the National Defense Research Committee (NDRC) to mobilize the nation's academic community for "research on the mechanisms and devices of warfare." In time, the NDRC would sponsor hundreds of research projects that ran the gamut from amphibious vehicles to rocket

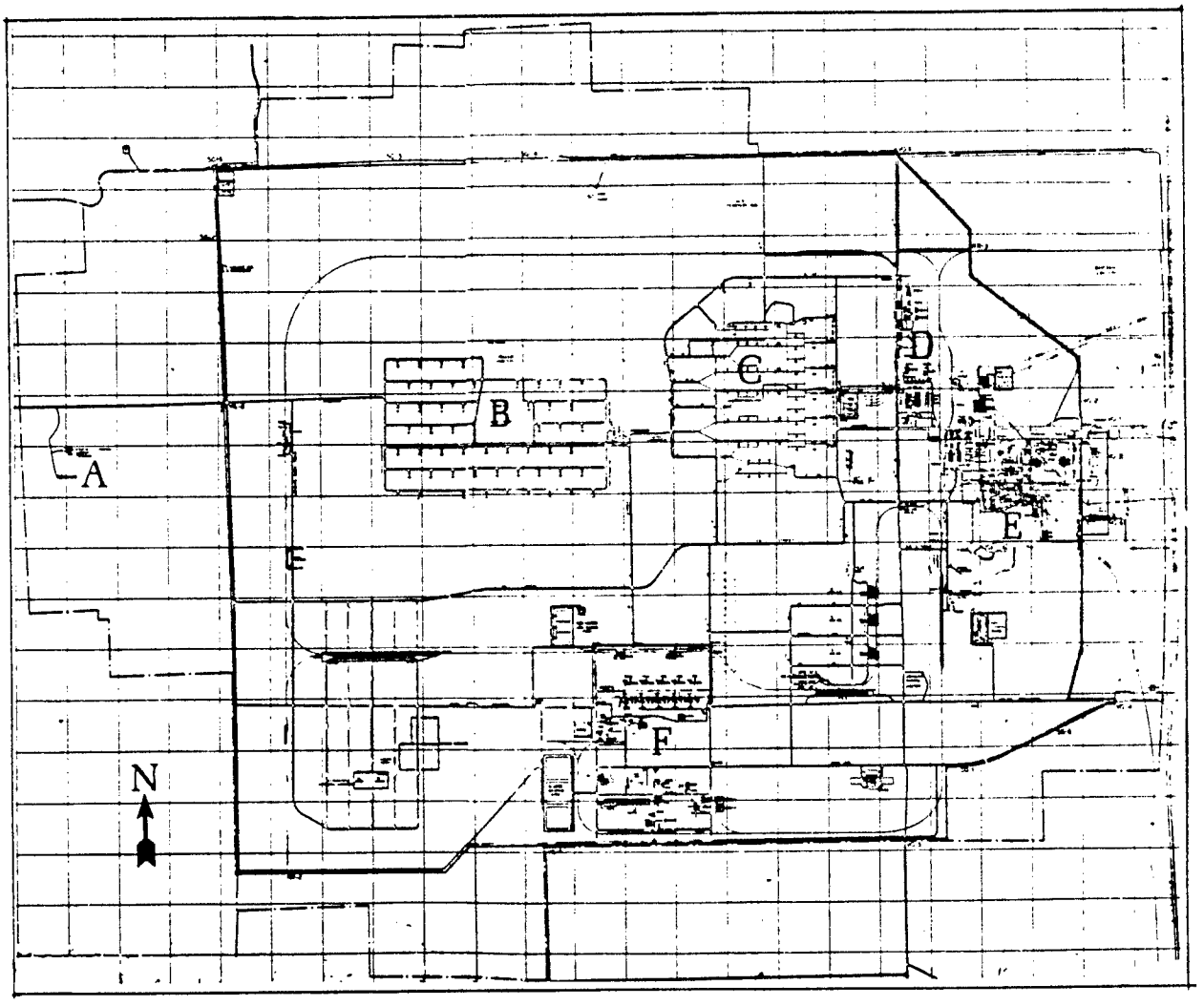

Figure 2: Newport AAP. Current Site Plan, dated 11-9-79, prepared by Uniroyal, Inc. (Source: Contractor files, Newport AAP)

A. Coast Guard Station.
B. Magazine Area.
C. Former RDX Area.
D. RDX Acid Area.
E. Chemical Plant Area.
F. TNT Plant Area.

propellants. Initially, however, it focused its attention on promising new technologies developed by the British in the area of high explosives.[4]

During the 1930s, British stategists had learned that German submarine hulls were being strengthened to withstand anything short of a direct hit by a conventional TNT-loaded depth charge. To counter the U-boat threat, the British Admiralty began seeking a more effective explosive, and its first choice was cyclonite. Discovered as early as 1899, cyclonite was known to be almost twice as powerful as TNT — but also several times more sensitive to shock, which prohibited its use in conventional ordnance. By the late 1930s, however, British scientists at the Armament Research Department at Woolwich Arsenal had determined that cyclonite could be sufficiently desensitized by combining it with wax, plasticizing oils, or TNT. As a security measure, the British rechristened cyclonite "Research Department Explosive," or RDX. And with a similar flair for anonymity, they chose the name "Composition B" for the desensitized mixture of 60% RDX and 40% TNT that was to be widely used in Allied naval ordnance during World War II.[5]

The RDX production method developed at Woolwich Arsenal, and first employed on a large scale at Bridgewater, England, in the summer of 1941, involved a simple batch process for the nitration of hexamine by concentrated nitric acid. Calling for eleven pounds of strong nitric acid for every pound of RDX produced, the Woolwich method required the construction of an enormous, on-site nitric-acid works, which made the process extremely expensive to implement and operate. Under NDRC direction, several laboratories were at work on alternatives to the Woolwich method by early 1941. But new

supplies of RDX were needed immediately. The British, unable to expand their manufacturing capacity because of German bombing, persuaded the United States to produce the explosive. To save valuable time, the U.S. Army stuck with the proven method: the contract for an RDX manufacturing plant near Newport, Indiana, stipulated that the Woolwich method and equipment be duplicated exactly. E. I. du Pont de Nemours & Company, of Wilmington, Delaware, already working with the Woolwich method on a pilot line, signed the contract to build and operate the new plant on 13 December 1941.[6]

Site Selection and Former Land Use

The first, and, at the time, the only RDX plant in the United States, Newport AAP was part of a network of more than 60 munitions plants built by the Army at the onset of World War II. The Army Ordnance Department began to search for sites in April 1941, using criteria that included:

(1) availability of suitable labor without requiring major housing projects;

(2) proximity to a main railroad line;

(3) availability of adequate electric power;

(4) ample supply of water for processing;

(5) availability of extended, isolated tracts for explosives manufacturing and storage;

(6) a location at least 200 miles from coastal waters and international borders as a defense against enemy attack.[7]

The Newport site satisfied these criteria. The depression of the 1930s had idled a large coal-industry labor force in the surrounding area, including Terre Haute, Indiana, and Danville, Illinois. The Chicago & Eastern Illinois Railroad was easily accessible, and the Army purchased a tract of land on the nearby Wabash River to provide the large amounts of water needed.[8]

The government acquired 21,986 acres from 62 landowners; most of the land had been used for farming.[9] The 66 clusters of buildings standing at the time included six cemeteries and one church.[10] At present, the cemeteries, including one said to date from 1810,[11] are maintained by Newport AAP. Of the original buildings, only three remain today. A wood-frame barn (Building TC-99), visible from State Highway 63, stands near the eastern boundary of the plant. Near the western boundary, between the two loading docks (Buildings VG-137/138 and VG-139/140) on Loading Dock Road, is a small (ca. 12' square) building that may have been a milk house or ice house. Its brick cavity walls are covered with stucco inside and out, and the pyramidal, wood-shingled roof is surmounted by a brick chimney that may have been used for ventilation rather than smoke exhaust. Both buildings are in poor condition. Building H-505, outside the fenced compound but just inside the western boundary of Newport AAP, is a one-and-one-half story brick house, currently used by the Coast Guard in connection with their LORAN (communications) station nearby. The house appears to date from the 1920s, and is in good condition. None of these buildings are architecturally unusual or historically notable.

Construction

The atmosphere of urgency surrounding RDX-production research carried over to the construction of Newport AAP. Although former landowners were given time to vacate -- in some cases 60 days -- District Court orders gave the government immediate possession of the land, and construction began on 12 January 1942.[12] Work progressed quickly: the Administration Building (Building 703) was ready for occupancy in mid-March, and by May the project was reported as 10 percent ahead of schedule.[13] The first production took place on 20 July 1942, just after the 18-month schedule set by the contract.[14]

Because of the large amount of acid required by the Woolwich method, the Nitric Acid Plant at Newport AAP was the largest in the world at the time of construction[15] (Figure 3). To provide the great volume of water required by the process, six Ranney Wells were built on the Wabash River land (Figure 4). These wells used a system of lateral collection pipes, branching from the main caissons into the surrounding aquifer, to allow the "fullest utilization of the available groundwater."[16] The acid and RDX lines started production in October 1942, and by August 1943 the entire plant was in operation.[17] In addition to the Administration, Acid, and RDX facilities, the plant included a Power House (Building 401A), shops, various inert storage warehouses, and two magazine areas, with approximately 100 "Richmond" Magazines (Figure 5).

Work on a smokeless powder area began in July 1942, but was stopped in April 1943; the project was revived, and cancelled again, in 1945.[18] Rows

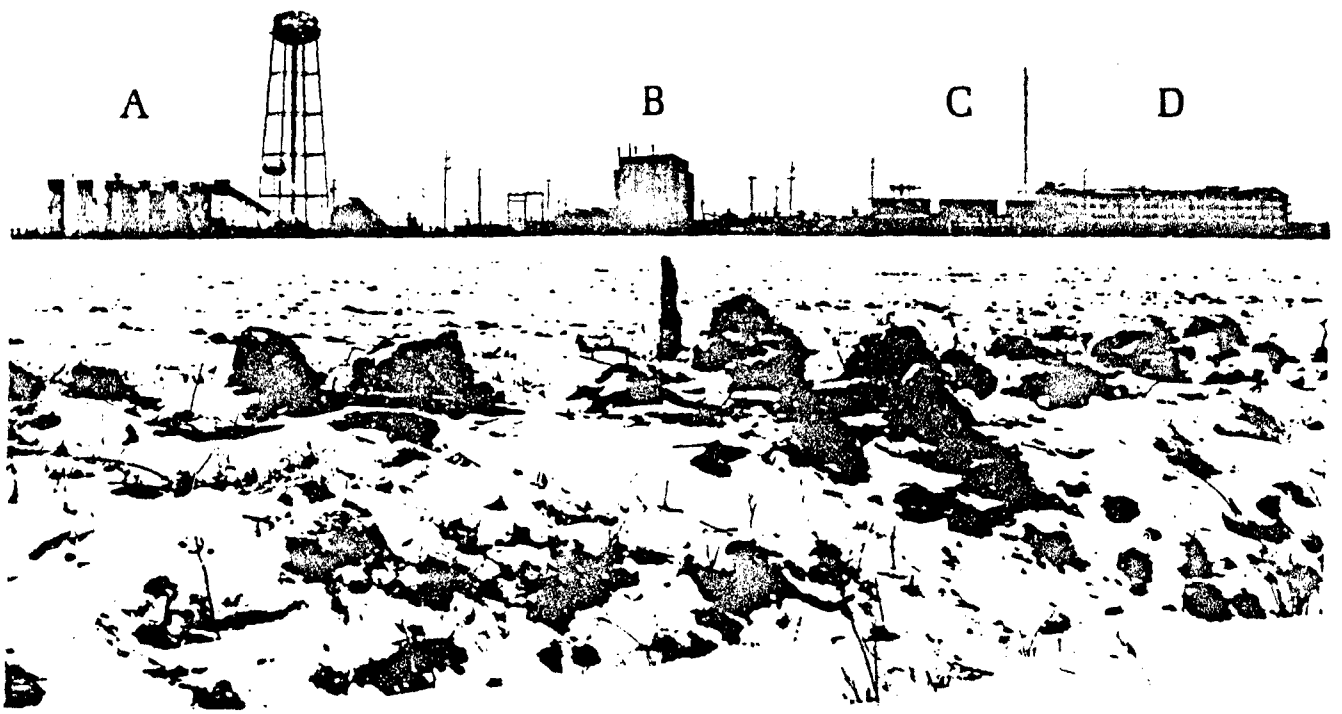

Figure 3: RDX Acid Area, view looking east from 11th Street. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

A. Power House (Building 401A).

B. Ammonia Oxidation Plant (Building 302A).

C. Sulfuric Acid Concentrator (Building 308A).

D. Nitric Acid Concentrator (Building 303A).

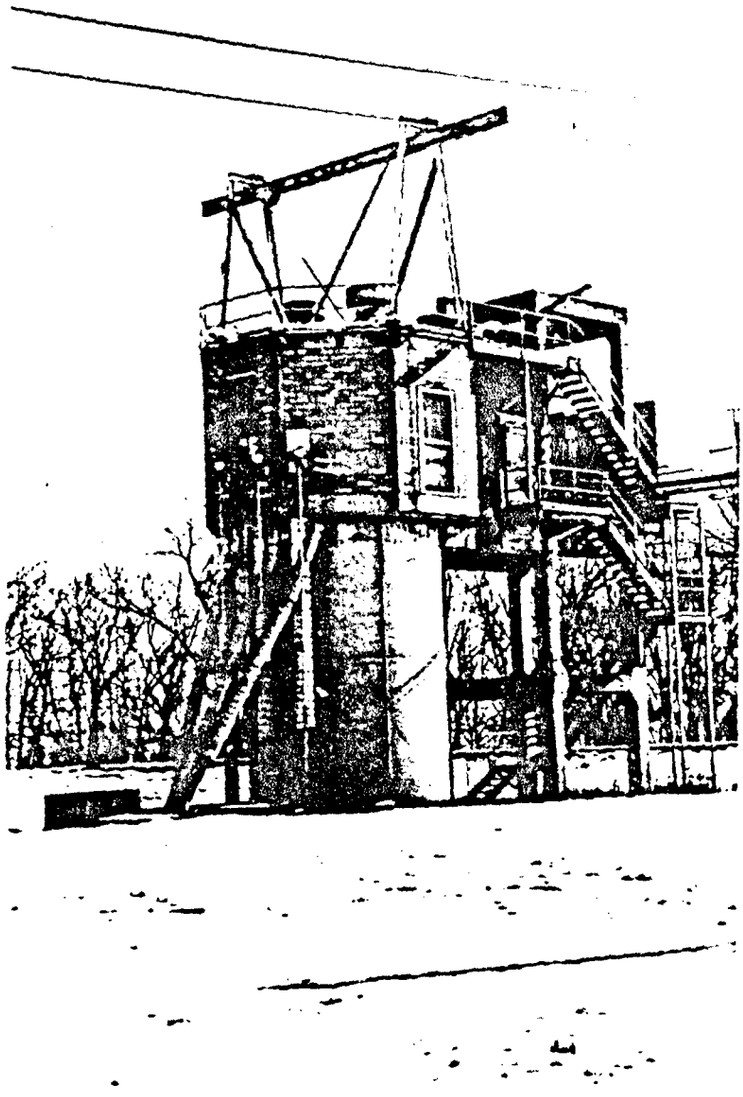

Figure 4: View looking southeast of Building 404-B, one of six Ranney Wells built near the Wabash River to supply water for Newport AAP. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

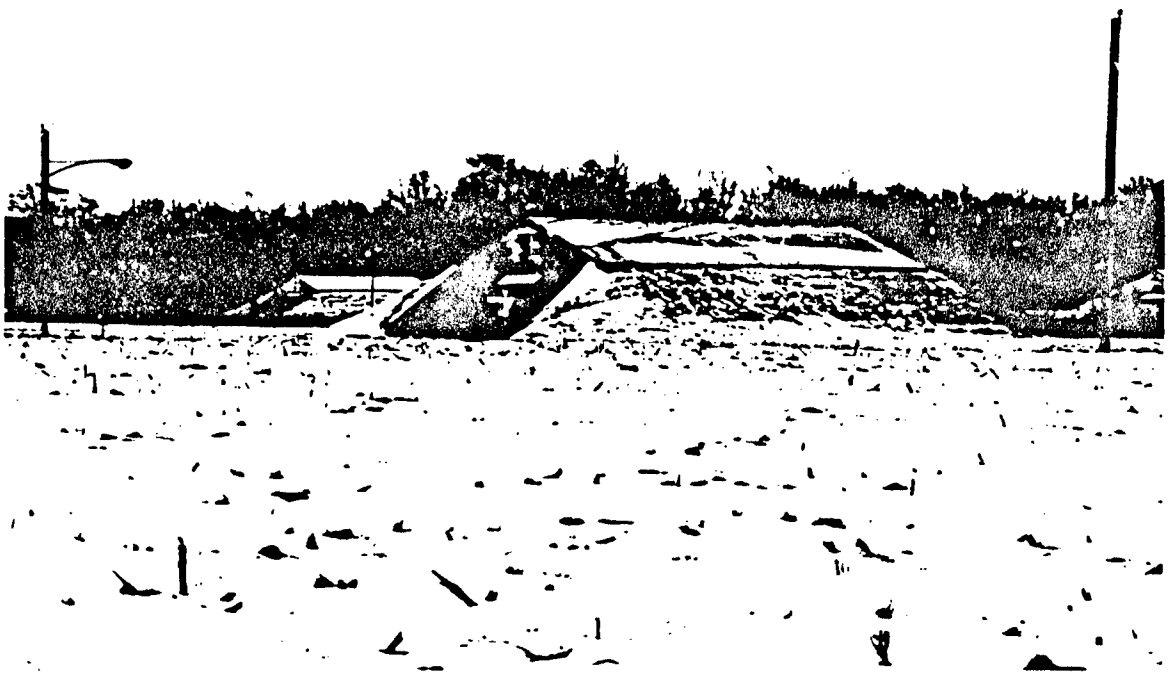

Figure 5: Richmond Magazine (Building 15), north and west facades. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

of concrete explosion walls, referred to as "the Bookends" (Figure 6), still stand in a field between the Inert Storage Area and the new TNT Plant Area.

Another addition to the plant was a heavy water manufacturing facility, built by du Pont in the present Chemical Plant Area, in 1943-1944. This was one of three similar distillation plants built at the same time to supply heavy water for the Manhattan Project's nuclear fission research. Located at ordnance works with excess steam capacity (the other two were Morgantown, West Virginia, and Alabama), the heavy water plants shared the Manhattan Project's thick blanket of secrecy. Writing in 1943, the Newport AAP historian could say only that a "fairly substantial" addition to the plant was under construction: "nothing is known about it except that it is started."[19]

Because some building materials, including steel, were scarce during the war, many buildings at Newport AAP were framed in wood and covered with corrugated asbestos (transite) or corrugated metal (Figure 7). Where greater bearing strength or fire-resistant qualities were necessary, poured concrete slab, concrete-frame, or steel-frame construction was used, with structural clay tile or brick infill (Figure 10). The architecture of the buildings was strictly utilitarian.

Figure 6: "The Bookends" were built in 1942 as part of a projected Smokeless Powder Area. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

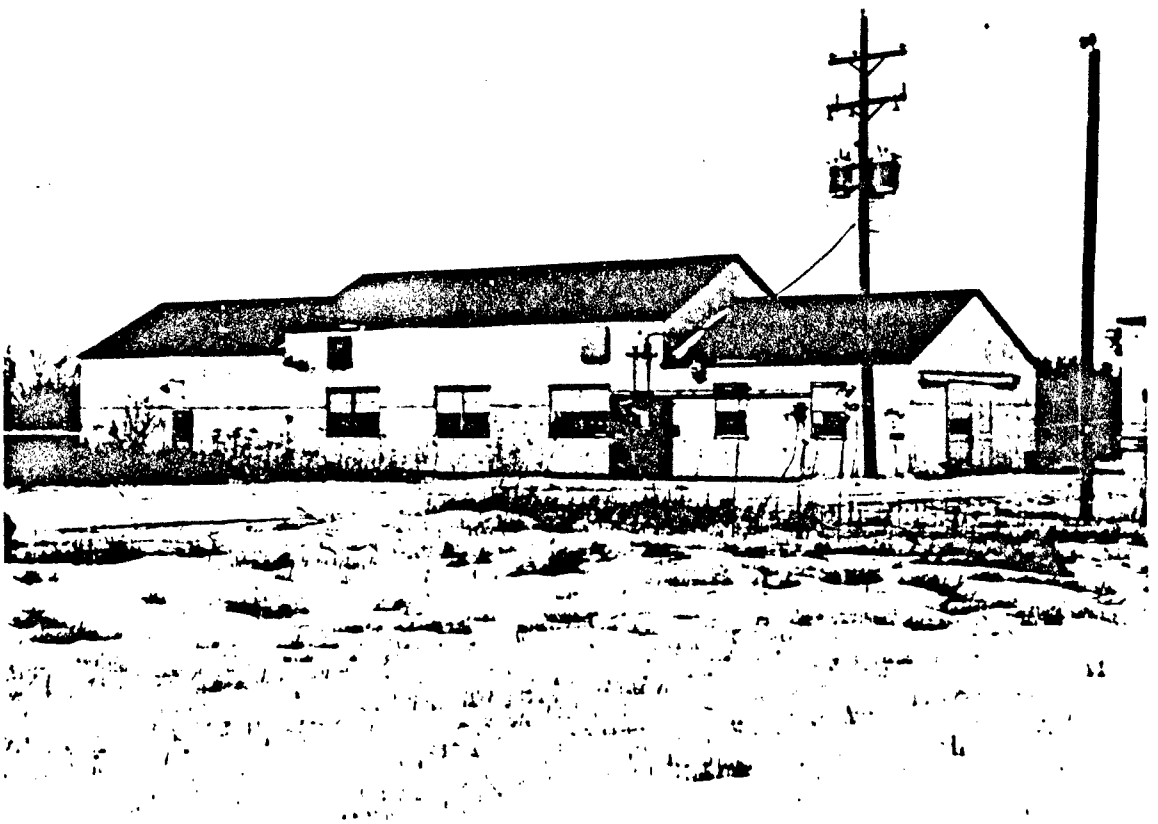

Figure 7: This Warehouse (Building 122A) is typical of Newport AAP's wood-framed, metal-sided buildings. South and west facades. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

Technology

Of the two basic raw materials needed for the manufacture of RDX, Newport AAP purchased hexamine ("a common . . . chemical made by reacting formaldehyde and ammonia"[20]) from outside suppliers, but produced its own nitric acid in the vast facility that one observer called "a nitric-acid-plant dog with a RDX-plant tail."[21] Only its size was unique; the process embodied standard technology developed by du Pont in the mid-1920s. In this process, liquid ammonia was vaporized and mixed with heated compressed air in the presence of a platinum catalyst to form nitrogen oxides. The nitrogen compounds were then further oxidized with air and fed into an absorption tower, where they combined with water to form 60% nitric acid. The oxidation and absorpton processes took place in Building 302A[22] (Figure 8).

The manufacture of RDX required highly concentrated nitric acid. To achieve this level of concentration, the Newport AAP used the time-honored technique of concentrating the 60% nitric acid by dehydrating it with sulfuric acid. This process occurred in dehydration towers at Building 303A (Figure 9). The spent sulfuric acid, now diluted with water, was collected in concentrator drums at Building 308A (Figure 10), where it was dehydrated by blasts of hot gases from oil-fired furnaces. The reconcentrated sulfuric acid was then ready to be recycled in the nitric acid operation.[23]

The production of RDX itself was a fairly simple process, beginning with the mixing of hexamine and 98.5 - 99.5% nitric acid in a nitrator under

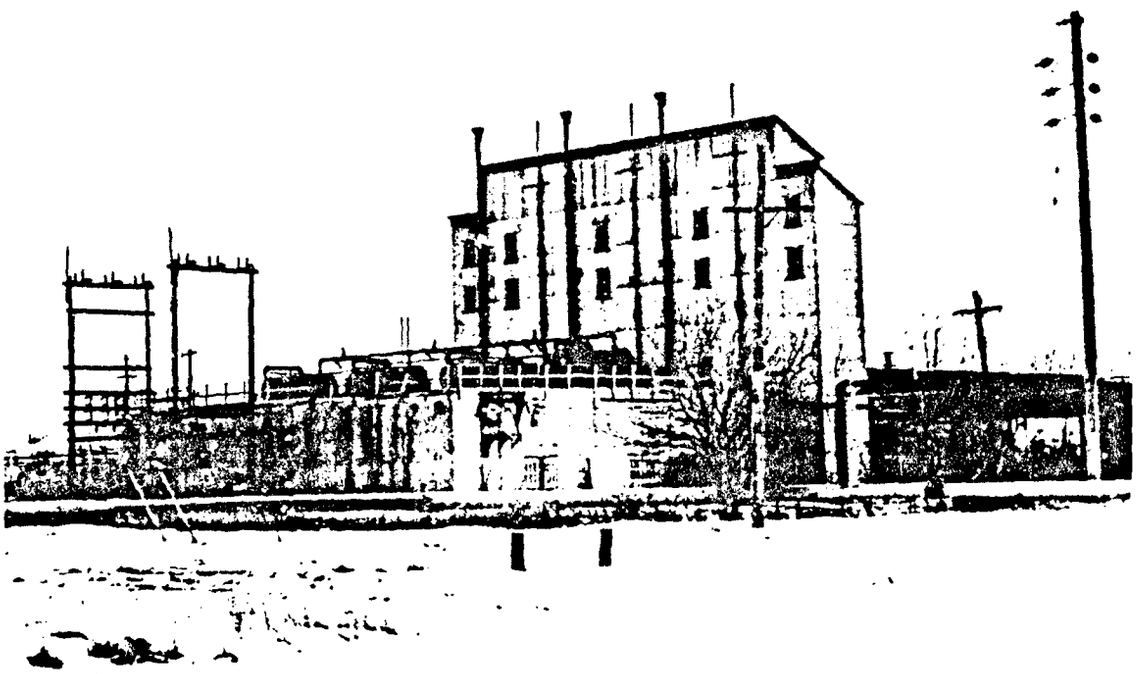

Figure 8: Ammonia Oxidation Plant (Building 302A), north and west facades. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

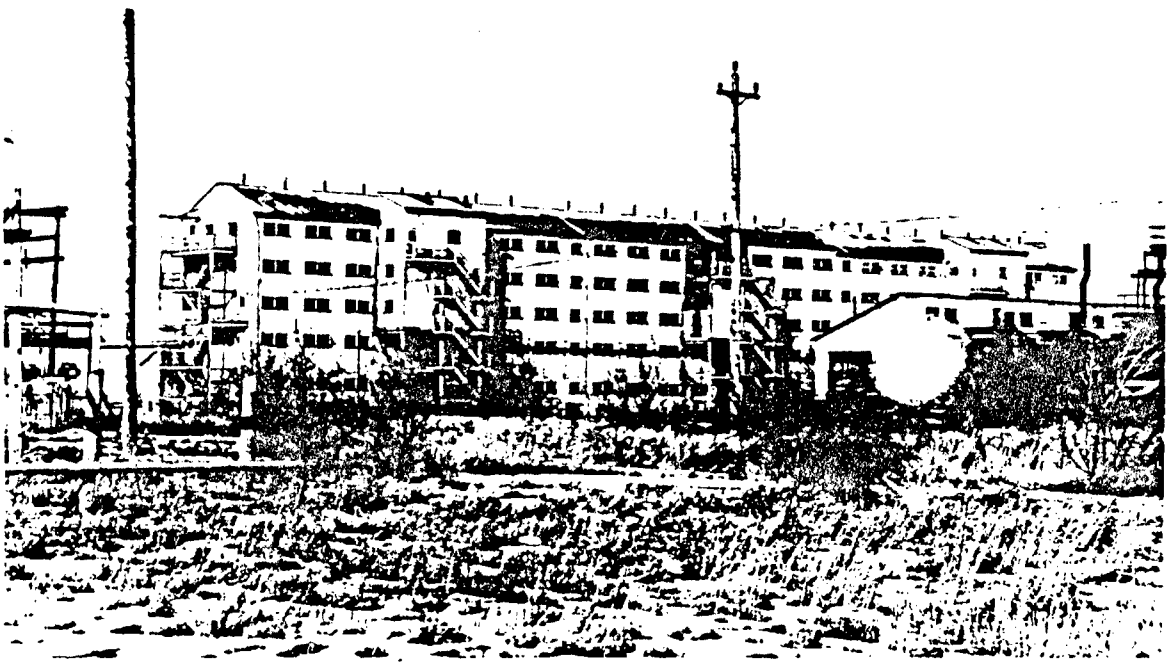

Figure 9: Nitric Acid Concentrator (Building 303A), south and east facades. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

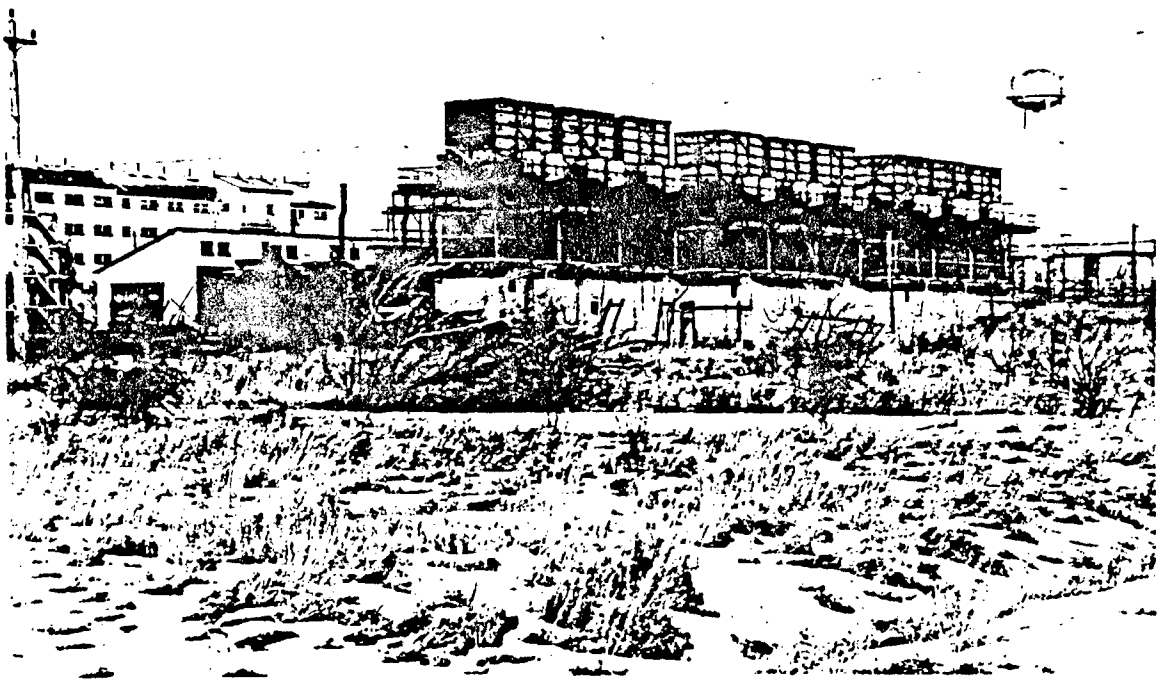

Figure 10: Sulfuric Acid Concentrator (Building 308A), south and east facades. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

First level: monolithic concrete. Second level: steel frame, brick infill. Third level: steel-reinforced wood tanks.

continuous agitation and cooling. The crude RDX was stabilized by drowning and further refined through a series of boiling, milling, and filtering steps. Nitrous fumes given off at the stabilization stage were collected and drawn through a series of absorption towers to recover 60% nitric acid for reconcentration in the acid area.[24]

The crystallized RDX was then ready for incorporation into various compounds that, unlike the pure product, could be handled, shipped, and loaded safely. Composition A, a blend of RDX and wax, was used to load small artillery shells; Composition C was moldable plastic explosive. Composition B, 60% RDX and 40% TNT, was by far the most important — during the last part of 1944, Newport and Holston AAPs together were producing 50,000,000 lbs. of Composition B per month, compared with 1,200,000 lbs. of Composition C and 250,000 lbs. of Composition A.[25]

Even while Newport AAP was under construction, research directed to finding an alternative to the cumbersome and expensive Woolwich method was beginning to bear fruit. Early in 1941, Werner E. Bachmann, an organic chemist at the University of Michigan, developed a process that greatly reduced the nitric acid requirement and increased the RDX yield. Introducing the Bachmann method in 1942, the Holston Ordnance Works at Kingsport, Tennessee attained nearly six times Newport's production capacity. Although improvements by du Pont eventually reduced the cost of Newport's RDX to approximately that of Holston's, the Bachmann method's productivity and far lower plant cost rendered the Newport RDX plant obsolete.[26]

Because it was the only plant capable of producing Compositions A and C, Newport AAP remained active, turning out 12% of national RDX production through the end of World War II. The plant also became the primary producer of HBX, a further desensitized form of the Composition B/aluminum powder "Torpex" used by the Navy. These specialized capabilities placed Newport AAP in the "nucleus group" of explosives plants not declared excess after V-J Day. Du Pont placed the plant, including the Heavy Water Plant, in layaway, and turned it over to the government on 23 November 1946. The Army Ordnance Corps maintained the plant and sold off various tracts of land, including three of the six Ranney Wells, reducing the area to 6,990 acres.[27]

KOREAN WAR TO THE PRESENT

The Army reactivated Newport AAP in 1951 to produce explosives for the Korean War. The Liberty Powder Defense Corporation, a subsidiary of Olin Corporation, operated the plant, after rehabilitating several production lines and parts of the Acid Area. Products included RDX and Compositions A, C, and D, a desensitizer also produced in small amounts during World War II. The Heavy Water Plant was also reactivated and renamed the Dana Plant, U.S. Atomic Energy Commission. Under the operation of du Pont, it began production in May 1952. Du Pont built several warehouses (including Buildings 203, 710, 713, 715, 716, 717, 729) and administrative and service buildings (including Buildings 101, 701, 703, 705, 707) at this time. Both the RDX and the Heavy Water facilities were laid away in 1957.[28]

In 1959 the Army selected Newport AAP as the site for a new plant to manufacture Chemical Agent VX, a nerve agent. The FMC Corporation of New York built the plant on the site of the old Heavy Water Plant, using some of the existing distillation towers and demolishing the rest of the buildings. Operated by FMC, the Newport Chemical Plant (major buildings included Buildings 140, 143, 144, 145) was in production from April 1961 to June 1968. The production area was laid away in September 1968; filling and shipping operations continued until 1969.[29]

In 1968, du Pont was awarded a contract to design facilities for continuous TNT production. Plans called for a five-line plant that could be expanded to 11 lines. Fegles Construction Company, Inc./C&I Girdler, Inc., began construction in September 1968. The completed facility consisted of an Acid Area (major buildings included the Ammonia Oxidation Plant, Building 3023, and the Nitric Acid Concentrator, Building 3221), a Power Area (including the Power House, Building 4011), and a Manufacturing Area (including Nitration and Purification Buildings, Buildings 9511-9515 / Figure 11, and Finishing Buildings, Buildings 9611-9615). A Red Water Handling Area, designed to treat TNT-contaminated waste water, was centered around the Red Water Destruction Facility (Building 9915 / Figure 12). The plant produced TNT between May 1973 and April 1974, and was then laid away by du Pont.[30]

Olin Mathieson Chemical Corporation, which had absorbed Liberty Powder Defense Corporation, continued to maintain the RDX plant in layaway until the end of 1964. In the late 1970s, most of the RDX facilities were demolished. Of these facilities, only the Ammonia Oxidation Plant

Figure 11: Nitration and Purification Building (Building 9515), north and east facades. The building is earth-sheltered; the above-ground concrete block structures are service buildings. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

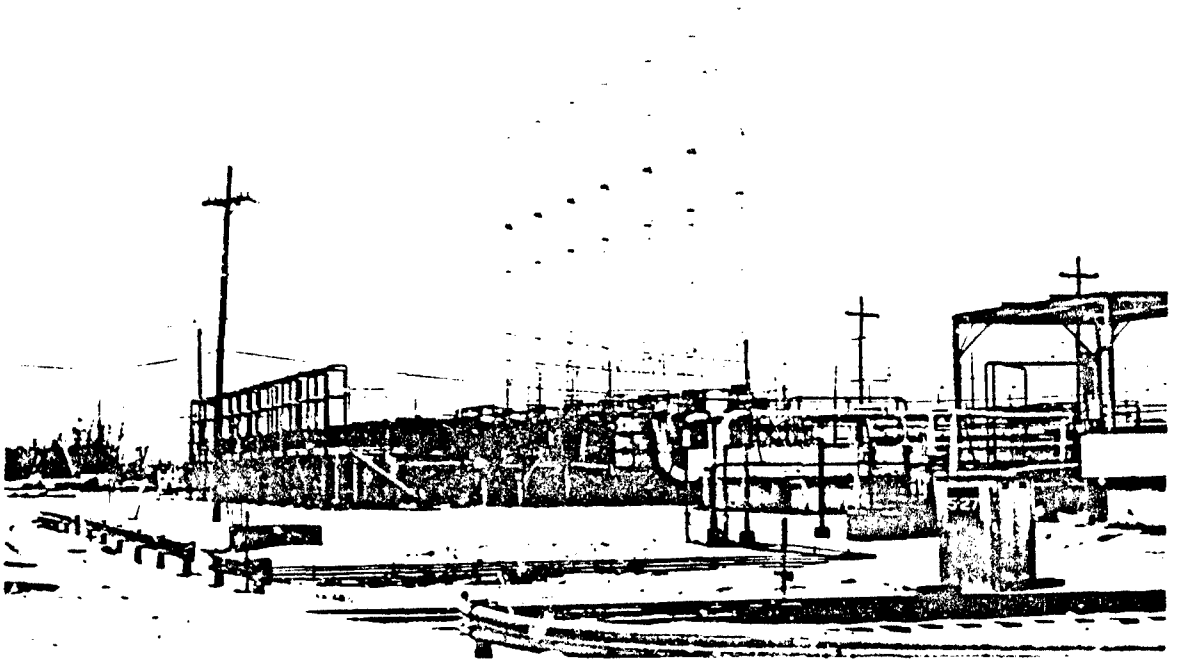

Figure 12: Red Water Destruction Facility (Building 9915), view looking northwest. (Source: Field inventory photograph, Robert Ferguson, MacDonald and Mack Partnership, 1984)

(Building 302A), the Nitric Acid Concentrator (Building 303A), the Sulfuric Acid Concentrator (Building 308A), the Power House (Building 401A), and several utility and storage buildings remain in 1984. Uniroyal, Inc., of Naugatuck, Connecticut, has been the operating contractor since 1 July 1975.[31]

NOTES

1. Harry C. Thomson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960), p. 136.

2. The common term "nerve gas" is a misnomer as applied to Newport AAP's product: unless mechanically dispersed, Chemical Agent VX remains a liquid through a wide range of temperatures and pressures.

3. This background information is found in "Newport Army Ammunition Plant: Installation History" (Newport AAP, n.d.), pp. 5-8; and "DARCOM Installation and Activity Brochure: Newport Army Ammunition Plant" (Newport AAP, 30 June 1980), pp. 1-3.

4. On the formation of the NDRC, see James Phinney Baxter, III, Scientists Against Time (Boston: Little, Brown and Company, 1946), pp. 14-25, 119-123, 451.

5. The British work with RDX during the 1930s is described in W. H. Simmons, "The Manufacture of R.D.X. in Great Britain," Industrial Chemist, 24 (July 1948), (August 1948), (September 1948), 429-432, 530-544, 593-601; R. C. Burton, "The Origin of Holston Army Ammunition Plant," speech before Rotary Club of Kingsport, Tenn., Sept. 10, 1975 (Kingsport: n. pub., 1975), n.p., in Palmer Room, Kingsport Public Library. On the use of RDX in naval ordnance, see Buford Rowland and William B. Boyd, U.S. Navy Bureau of Ordnance in World War II (Washington, D.C.: U.S. Government Printing Office, n.d.), pp. 204-207; Constance McLaughlin Green, Harry C. Thomson, and Peter C. Roots, The Ordnance Department: Planning Munitions For War (Washington, D.C: Office of the Chief of Military History, Department of the Army, 1955), p. 463.

6. Burton, n.p.; Baxter, pp. 256-257. Rowland and Boyd, p. 205, relate du Pont's previous involvement with RDX; "DARCOM Brochure," p. 1, provides the date of the contract.

7. Lenore Fine and Jesse A. Remington, The Corps of Engineers: Construction in the United States (Washington, D.C.: Office of the Chief of Military History, United States Army, 1972), pp. 134-137.

8. "DARCOM Brochure," pp. 10-11; "Government Takes 1,555 Acres More," Terre Haute Star, March 19, 1942.

9. According to "Installation History," p. 5. William Voight, Jr., "The Ordnance Organization in World War II," (unpublished report, 1945, on microfiche, in U.S. Army Armament, Munitions, and Chemical Command (AMCCOM) Historical Office, Rock Island Arsenal), p. 312, gives 21,970 acres. "DARCOM Brochure," p. 1, gives 41,986.47 acres.

10. "DARCOM Brochure," p. 1; William E. Reseigh, Donald R. Cochran, and William R. Wepler, An Archaeological Survey of the Newport Army Ammunition Plant (unpublished report prepared by Archaeological Resources Management Service, Department of Anthropology, Ball State University, Muncie, Indiana, September 30, 1982), pp. 30-34.

11. The author visited Juliet Cemetery, off 13th Street near the northern boundary of Newport AAP, but was unable to verify the date on the single grave marker as 1810. The third number in the date could be a European "1" with a tail, but it could also be a "4." Some proponent of the "4" hypothesis has recently scratched in the cross bar, making determination difficult.

12. "Government Moves to Condemn Land for Ordnance Works Site," Terre Haute Star, (undated newspaper clipping in Vermillion County Public Library, Newport); "Government Takes 1,555 Acres More;" "DARCOM Brochure," p. 1.

13. "Wabash River Ordnance Works Offices Are Moved to New Administration Building," Danville, Illinois Commercial-News, March 23, 1942; Fine and Remington, p. 517.

14. Voight, p. 312. Fine and Remington mention the 18-month schedule on p. 517.

15. Baxter, p. 257; Burton, n.p.

16. A similar system had been installed at Indiana AAP, near Charlestown, two years earlier. See "Radial Wells for Powder Plant Water Supply," Engineering News-Record, 127 (July 31, 1941), 45.

17. Voight, p. 312.

18. "DARCOM Brochure," p. 1.

19. "Installation History," p. 5, Voight, p. 314. Fine and Remington devote their Chapter XX to the Corps of Engineers' involvement with the Manhattan Project, dealing with the new heavy water plants on p. 676. Heavy water was needed as a substitute for potentially unreliable graphite in Enrico Fermi's reactor piles.

20. Burton, n.p.

21. Burton, n.p. R. C. Burton, General Superintendent of Production at Holston Ordnance Works during World War II, was well-qualified to make observations on RDX production.

22. On the du Pont Process, see Guy B. Taylor and others, "Manufacture of Nitric Acid by the Oxidation of Ammonia," Industrial and Engineering Chemistry, 23 (Aug. 1, 1931), 860-865.

23. The sulfuric acid reconcentration system in Building 308A was engineered by the New-York-based Chemical Construction Corporation (Chemico), using a design that it had standardized for the industry. The flowchart for the Chemico process found in R. Norris Shreve, The Chemical Process Industries, 3rd edition (New York: McGraw-Hill, 1967), p. 340, applies to the Newport AAP system.

24. This discussion is based on Simmons, et al., and on the explanations of building functions in "Pictorial Coverage of Newport Army Ammunition Plant" (government files, Newport AAP, n.d.), pp. 15-18. For the RDX process, building names and numbers are not given, since these buildings no longer exist.

25. C. H. Carter, Jr., et al., "History of the Powder and Explosives Section, March 1943 to September 1945" (unpublished report prepared for the Ammunition Division, Office of the Chief of Ordnance, 1945, on microfiche, AMCCOM Historical Office, Rock Island Arsenal), p. 10; Burton, n.p.

26. Baxter, pp. 256-259. Thomson and Mayo give the relative production capacities of the two plants on p. 136.

27. Carter, pp. 50, 82-84, Appendices IV-33, IV-69; Rowland and Boyd, pp. 206-207; "DARCOM Brochure," p. 1.

28. "DARCOM Brochure," p. 1; "Installation History," p. 5. On Composition D, see Carter, p. 71.

29. "DARCOM Brochure," p. 2; "Installation History," pp. 6-7, 20-21.

30. "DARCOM Brochure," pp. 2-3; "Installation History," pp. 6-7, 22-24.

31. "DARCOM Brochure," pp. 2-3.

Chapter 3

PRESERVATION RECOMMENDATIONS

BACKGROUND

Army Regulation 420-40 requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling.[1] The purpose of such a program is to:

- Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's heritage.
- Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the general preservation recommendations set forth below have been developed:

Category I Historic Properties

All Category I historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for

nomination regardless of age. The following general preservation recommendations apply to these properties:

a) Each Category I historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I historic properties should not be altered or demolished. All work on such properties shall be performed in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

b) An individual preservation plan should be developed and put into effect for each Category I historic property. This plan should delineate the appropriate restoration or preservation program to be carried out for the property. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulation. Until the historic preservation plan is put into effect, Category I historic properties should be maintained in accordance with the recommended approaches of the Secretary of Interior's Standards for Rehabilitation and

Revised Guidelines for Rehabilitating Historic Buildings[2] and in consultation with the State Historic Preservation Officer.

c) Each Category I historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.[3] When no adequate architectural drawings exist for a Category I historic property, it should be documented in accordance with Documentation Level I of these standards. In cases where standard measured drawings are unable to record significant features of a property or technological process, interpretive drawings also should be prepared.

Category II Historic Properties

All Category II historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination regardless of age. The following general preservation recommendations apply to these properties:

a) Each Category II historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category II historic properties should not be altered or demolished. All work on such properties shall be performed

in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

b) An individual preservation plan should be developed and put into effect for each Category II historic property. This plan should delineate the appropriate preservation or rehabilitation program to be carried out for the property or for those parts of the property which contribute to its historical, architectural, or technological importance. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulations. Until the historic preservation plan is put into effect, Category II historic properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings[4] and in consultation with the State Historic Preservation Officer.

c) Each Category II historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level

II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.[5]

Category III Historic Properties

The following preservation recommendations apply to Category III historic properties:

a) Category III historic properties listed on or eligible for nomination to the National Register as part of a district or thematic group should be treated in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800). Such properties should not be demolished and their facades, or those parts of the property that contribute to the historical landscape, should be protected from major modifications. Preservation plans should be developed for groupings of Category III historic properties within a district or thematic group. The scope of these plans should be limited to those parts of each property that contribute to the district or group's importance. Until such plans are put into effect, these properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised

Guidelines for Rehabilitating Historic Buildings[6] and in consultation with the State Historic Preservation Officer.

b) Category III historic properties not listed on or eligible for nomination to the National Register as part of a district or thematic group should receive routine maintenance. Such properties should not be demolished, and their facades, or those parts of the property that contribute to the historical landscape, should be protected from modification. If the properties are unoccupied, they should, as a minimum, be maintained in stable condition and prevented from deteriorating.

HABS/HAER Documentation Level IV has been completed for all Category III historic properties, and no additional documentation is required as long as they are not endangered. Category III historic properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.[7] Similar structures need only be documented once.

CATEGORY I HISTORIC PROPERTIES

There are no Category I historic properties at the Newport Army Ammunition Plant.

CATEGORY II HISTORIC PROPERTIES

There are no Category II historic properties at the Newport Army Ammunition Plant.

CATEGORY III HISTORIC PROPERTIES

There are no Category III historic properties at the Newport Army Ammunition Plant.

NOTES

1. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).
2. National Park Service, Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: Preservation Assistance Division, National Park Service, 1983).
3. National Park Service, "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines," Federal Register, Part IV, 28 September 1983, pp. 44730-44734.
4. National Park Service, Secretary of the Interior's Standards.
5. National Park Service, "Archeology and Historic Preservation."
6. National Park Service, Secretary of the Interior's Standards.
7. National Park Service, "Archeology and Historic Preservation."

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APPENDIX A

DEPARTMENT OF THE ARMY
NEWPORT ARMY AMMUNITION PLANT
P. O. BOX 121
NEWPORT, INDIANA 47966

January 25, 1984

REPLY TO
ATTENTION OF:

SMCNE-CO

SUBJECT: DARCOM Historic Survey

Mr. Robert Ferguson
MacDonald and Mack Partnership
215 Grain Exchange Building
Minneapolis, Minnesota 55415

Dear Mr. Ferguson:

Due to security requirements, photographing of high security areas is not permitted at Newport AAP.

Sincerely,

Craig A. Morehead
Captain, Ordnance Corps
Commanding